POLICY RESEARCH WORKING PAPER 2549

Measuring Poverty Dynamics and Inequality in Transition Economies

Disentangling Real Events from Noisy Data

Erzo F. P. Luttmer

Estimates of income inequality and the dynamics of poverty are highly sensitive to measurement error and transitory shocks in micro-level data. The apparent high levels of economic mobility in Poland and Russia are driven largely by transitory shocks and noisy data. There is a real risk of an entrenched underclass emerging in these transition economies.

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Summary findings

Luttmer uses instrumental variable methods and the decomposition of income into transitory and persistent components to distinguish underlying income inequality and changes in poverty from the effects attributable to measurement error or transitory shocks. He applies this methodology to household-level panel data for Russia and Poland in the mid-1990s. Luttmer finds that:

- Accounting for noise in the data reduces inequality (as measured by the Gini coefficient) by 10–45 percent.
- Individuals in both countries face much economic insecurity. The median absolute annual change in income or spending is about 50 percent in Russia and about 20 percent in Poland. But roughly half of these fluctuations reflect measurement error or transitory shocks, so underlying levels of income and spending are much more stable than the data suggest.
- The apparent high levels of economic mobility are driven largely by transitory events and noisy data. After transitory shocks are accounted for, about 80 percent of the poor in both Russia and Poland remain in poverty for at least one year. So there is a real risk of an entrenched underclass emerging in these transition economies.

This paper—a product of the Poverty Reduction and Economic Management Sector Unit, Europe and Central Asia Region—is part of a larger effort in the region to analyze poverty and inequality in Europe and Central Asia. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Cecile Wodon, room J7-268, telephone 202-473-2542, fax 202-473-8466, email address cwodon@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at luttmer@uchicago.edu. February 2001. (38 pages)

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1. Introduction

The purpose of this paper is to examine the problem of ensuring health-care coverage of rural and poor areas of developing countries. We focus primarily on the incentives facing medical service providers and analyze them in light of recent developments in contract theory. The approach is essentially theoretic but is motivated by experiences in several countries in Asia, Eastern Europe and Southern Africa.

Since 1977 the international health community has put a great deal of emphasis on ensuring universal access to basic primary care as a high priority for public action. While the rationale for this emphasis is questionable,[1] we take this goal as given. In practice, attempts to accomplish this goal have often been disappointing. Reliance on the private sector to put trained professionals in such areas is not warranted as demand for the services at the true opportunity cost of the professional's time is simply too low. State intervention is obviously needed. On the other hand, public performance has met with, at best, variable success. Disappointment stems from several sources but a common problem is the inability to staff and supply medical posts in rural areas. High rates of absenteeism (blatant or couched in terms of attending meetings, etc.), high rates of vacancies for postings, simple lack of conscientious or courteous care and frequent lack of supplies such as essential drugs are common in many public facilities.

Why is it so hard to run public clinics? We usually assume in the analysis of public expenditures that if the government wants a particular product or service, it simply pays for it and the product appears. We can debate whether these services are appropriate, but there is no ambiguity as to what is, in fact, purchased.[2] Here, however, we seem to face an essential inability to purchase a particular service at all. Apparently it is difficult to purchase medical services of agreed quality (including due diligence of effort, sufficient attendance, etc.) even from civil servants.

These problems with public provision do not necessarily argue in favor of abandoning the goals of basic health care coverage for the poor but they do highlight the fact that the costs of provision could be much higher than anticipated. The underlying problem is one of providing physicians with incentives at reasonable cost. The rest of the paper examines a number of theoretic models that attempt to solve aspects of this problem. For most of the paper we will use the principal-agent framework in which the government (principal) provides incentives to an agent (physician) through an explicit contractual arrangement, the terms of which will depend on, inter alia, the observability of actions and outcomes. We will be particularly interested in the role of "high powered"

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[1] See Filmer et al. for a critique of this approach to health care policy.

[2] This is the essence of cost/benefit analysis or project evaluation – quantities are usually assumed to be a technological given while intellectual attention focussed entirely on their valuation.

incentives and their limitations. Some comments on the provision of incentives when contracts cannot be written or enforced conclude the paper.

As a point of departure, let us assume that the government can actually see and contract for all relevant dimensions of health care. In this case, there is no incentive problem per se as it is possible to ensure that the wage at which the universality objective is met will yield the expected services. The problem is that this level of wages may be very high – much higher than is likely to be forthcoming in any practical sense. One reason is the existence of greater earnings opportunities in richer, more urban areas of the country. On top of this, of course, is the fact that medical personnel are generally much better educated and potentially have higher incomes than the country average and tend to want the amenities that go along with urban life. If they have families they will tend to want to give their children educational opportunities usually found in cities. A recent survey of medical personnel in Indonesia discovered that the amount of money necessary to get them to relocate to the more remote areas of the country (generally away from Java) was several multiples of actual wages.[3] At first glance, there does not appear to be a problem of ineffective incentives, but one of insufficient budget. There could well be good, economic, reasons for insufficient funds. If taxes to pay for government expenditures are distortionary, and most tax systems in poor countries are very distortionary indeed, then there is an additional social cost of meeting the universality objective. This gives a good reason to see if there is a way to reduce the overall cost of provision by exploiting the design of contracts to doctors (see section 2).

At the other extreme, we can assume that the government can observe nothing about physician performance – that is, it can't tell if there is a doctor in attendance in a village at all much less if she is charging (illegally if a public facility) or providing conscientious care. This is something of a straw man but does raise one point. In this case, a publicly employed doctor is indistinguishable from a completely unregulated private doctor (except that the public employee costs the government more). Except in idiosyncratic cases (such as a dedicated altruist or a doctor wanting to live in her home village regardless of income) there is no reason to believe any of the poor areas will be covered. Not only will it be costly to induce urban doctors to move (the constraint of the preceding paragraph), but without performance incentives the real cost of services will escalate dramatically. One is then left to wonder where, given the inherently high cost, the desirability of universal provision comes from.

Intermediate within these extremes are cases in which some sort of information is available or can be obtained at some cost, say by improved monitoring. In such cases we will look at the tradeoff between improving performance with incentives and controlling costs imposed by different information structures. Of course, incentives can be provided

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[3] Chomitz et al. (1998). Interestingly, they did find that promises of placement in graduate education would induce doctors to relocate. However, this seems to depend on a highly distorted, non-transparent system of graduate admissions, leverage that would disappear should medical education be reformed.

to reflect measurement error or to have relatively small effects on one's underlying material well-being (compared to persistent shocks), it is interesting to consider the inequality and poverty dynamics after income or consumption has been purged of these transitory shocks.[2] Second, we try to estimate the variance of measurement error by using instrumental variables. With these estimates of the importance of measurement error, one can then estimate the inequality in underlying material well-being. Finally, we time-average income or consumption for families. By taking an average over a period of time, measurement error and transitory shocks will be partially averaged out (Shorrocks, 1978). This too, allows us to get a better estimate of underlying inequality.

The paper presents three main findings. First, accounting for noise in the data substantially reduces inequality measures. Since this reduction is most pronounced in Russia, underlying inequality in these two countries is more similar than the uncorrected inequality measures would suggest. Second, individuals in both countries face much economic insecurity – the median absolute annual change in income or expenditure is around 50% in Russia and around 20% in Poland. However, around half of these fluctuations reflect measurement error or transitory shocks. Hence, underlying income or expenditure levels are much more stable. Third, the apparent high levels of economic mobility are largely driven by transitory events and noisy data. After accounting for transitory shocks, around 80% of the poor in Russia and Poland remain in poverty for at least one year.

2. A Fashion Metaphor

Perhaps the following metaphor can illustrate the distinction between underlying well-being and transitory effects on well-being. Imagine that everyone has a wardrobe with seven outfits and we are interested in "fashion" inequality. In the morning, individuals would randomly choose an item from their wardrobe. On a given day, we go out and (perfectly) measure the inequality in the quality of clothes that people are

[2] To be sure, transitory shocks can have profound effects on welfare too, especially when families lack formal or informal mechanisms to smooth consumption. In general, however, transitory shocks have less

wearing that day. The inequality could result from two sources. It could reflect underlying inequality – some people have wardrobes with only nice clothes while others have wardrobes with only old worn-out clothes. Alternatively, the measured inequality could reflect idiosyncrasies of individuals' choices of what to wear that particular day – everybody might have exactly the same wardrobe at home, but some happen to wear a fancy suit that day while others selected their ragged jeans. In practice, we would expect the fashion inequality we found that day to partly reflect underlying inequality and to partly reflect idiosyncratic events of that day. The methodology section explains in detail how these two sources of inequality can be distinguished empirically.

In the metaphor above, we assumed perfect measurement with regard to the quality of people's clothes. In practice, however, the interviewers who rate the quality of clothes may make errors. The interviewers may make mistakes recording the ratings or may have different or changing tastes. Hence, two people wearing exactly the same outfit may get different fashion ratings, or the same person wearing the same outfit on two different days might get two different ratings. Assume that the interviewers do not make systematic mistakes and that their mistakes are unrelated over time (alternatively, in each period, a person's fashion quality gets rated by a randomly chosen interviewer). In this case, the mistakes will lead to overestimates of the true amount of inequality and mobility. Even if everyone wore exactly the same outfit, we would still find measured inequality and mobility because of the variation in the interviewers' ratings.

Suppose we find someone who got a good fashion rating today but had always received poor fashion ratings previously. What happened? Three things could have happened. First, this person could have upgraded his wardrobe. This would correspond to a true increase in underlying well-being. Second, the wardrobe remained the same, but the individual happened to wear a particularly nice outfit today. This would correspond to a transitory shock. Third, the individual wore the same clothes today as he had always worn, but the interviewer happened to be in a good mood and gave him an extraordinarily nice rating. How can we distinguish these three events?

First, by looking at future ratings, it is possible to distinguish between a change in underlying well-being (the quality of the wardrobe) on the one hand, and transitory

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profound effects than permanent ones.

events and measurement error on the other hand. If the wardrobe had been upgraded, we would expect future ratings on average to be as nice as today's. However, if today's nice rating was caused by an idiosyncrasy or measurement error, we would expect future ratings to revert to the old, lower levels. Hence, both transitory events and measurement error would show up as many movements up and down the fashion hierarchy but all these movements would tend to be undone in the next period. This intuition underlies the procedure that distinguishes persistent and transitory shocks. This procedure is presented formally in the next section.

Second, one might obtain three independent measures of the quality of a person's outfit; for example the outfit's price, age and the interviewer's rating. If there were no measurement error, all three measures would always move in the same direction. We can then find the measurement error in each measure by seeing how often that measure moves in a different direction than the other two. Once we know the amount of measurement error in the interviewer's ratings, we can calculate the likelihood that an increase in the ratings was due to the person wearing a nicer outfit. One can interpret two of the measures of fashion quality as instruments for the third measure. This instrumental variables procedure is developed formally in the next section.

3. Data and Methodology

Data

The data for Russia come from the Russian Longitudinal Monitoring Survey (RLMS), which is a nationally-representative socioeconomic survey of the Russian Federation. We use the panel component of waves 5 through 8 which were fielded in the falls of 1994, 1995, 1996 and 1998. This yields a sample of 7,382 individuals in 2,256 households with complete demographic, income and expenditure information. More details about this dataset can be found on the website of the University of North Carolina at Chapel Hill (www.cpc.unc/projects/rlms/project.html) and in Lokshin and Popkin, 1998.

The Polish data consists of the 1993-1996 panel component of the Household Budget Survey conducted by the Polish Central Statistical Office. The survey is fielded throughout the year. We used a balanced panel with 16,552 individuals in 4,919 households with complete demographic, income and expenditure information. More details of this dataset can be found in Okrasa (1999a,b).

Non-random attrition is a potentially serious problem. The University of North Carolina's website and Okrasa (1999a) analyze attrition in each of the data sets. They find that households with better economic positions and households in urban areas are more likely to drop out of the sample. It is hard to infer whether and how this pattern of attrition affects the results.

The main measures of economic well-being used in this paper are the logarithm of monthly consumption expenditure and the logarithm of monthly income. Both measures are adjusted for household size using an equivalence scale.[3] In the Polish data, the recall period for all expenditure items is one month, while in the Russian data recall periods vary between one week for food expenditure, one month for services and utilities, and three months for clothes, shoes and durables. The expenditure data includes actual expenditure on durables rather than imputed rental values of these goods. Hence, one might worry that finding that most shocks are transitory largely reflects sporadic purchases of durables or other lumpy goods. To address this concern, the total analysis was repeated using only food expenditures, which accounts for 47% of total expenditure in Russia and 42% of total expenditure in Poland. The dynamics of food expenditures are broadly similar to those for total expenditure, and a discussed in more detail in the sections below.

The analysis below is performed on the whole sample as well as on subsamples conditioned on demographic characteristics. For the measurement of shocks, we take the second period of the 4 period panel as the base period. Hence, the base period is the fall of 1995 in Russia and 1994 in Poland. Unless otherwise noted, demographic characteristics are measured in the base period.

[3] We use an equivalence parameter θ of 0.75, i.e., equivalent size = (number of household members)$^{0.75}$.

A Model of Income and Expenditure Dynamics

Atkinson, Bourguignon and Morrisson (1992) and Birdsall and Graham (2000) provide excellent overviews of the multitude of techniques used to examine mobility and their interpretations. Many popular mobility measures, such as transition matrices, compare mobility across two periods in time. Empirical examinations of mobility, however, reveal that current income movements tend to be related to past movements; in other words, the mobility process is not first-order Markov (Shorrocks, 1976). For example, a positive transitory shock first generates upward mobility followed immediately by downward mobility. In order to distinguish between movements that persist and those that are undone in the following period, we first estimate a simple model of the income or expenditure process. Next, we use this model to calculate traditional mobility measures on the underlying component, which is the component after transitory shocks have been removed.

A random walk plus noise is a simple and popular way of characterizing an expenditure of income pattern that recognizes both transitory and persistent shocks (Friedman, 1957, or Gottschalk and Moffitt, 1993). The model is phrased in terms of log consumption expenditure but it is also applied to log income. Log consumption expenditure of individual i in period t, C_{it} , consists of an underlying level, C_{it}^*, and a transitory shock (possibly including measurement error), ε_{it}:

(1) $C_{it} = C_{it}^* + \varepsilon_{it}$

We define the ε-shocks to be transitory in the sense that only occur for one period and are unrelated to past or future shocks. Conditional on the underlying level of consumption, the transitory shocks, ε_{it}, have mean zero and variance $\sigma^2_{\varepsilon,t}$. Because transition economies are undergoing a process of structural change, the variance of the shocks is allowed to vary over time. The underlying component of consumption evolves subject to a common trend, α_t , and a persistent shock, η_{it}:

(2) $C_{it}^* = C_{i,t-1}^* + \alpha_t + \eta_{it}$

The trend, α_t , may vary over time but is the same for all individuals. The persistent shocks, η_{it}, have an unconditional mean of zero and variance of $\sigma^2_{\eta,t}$. We define persistence to mean that these shocks last for at least 2 periods (possibly longer, but this cannot be estimated from 4-period data without functional form assumptions). The

underlying component of consumption reflects past persistent shocks. Since we allow mean reversion of persistent shocks over periods beyond 2 years, persistent shocks may be correlated with underlying consumption.

The definition of transitory implies that the ε-shocks cannot be correlated with future or past shocks:

(3a) $E[\varepsilon_{it}, \varepsilon_{i,t-j}] = 0 \quad \text{for } j \neq 0$

(3b) $E[\varepsilon_{it}, \eta_{i,t-j}] = 0 \quad \text{for } j \neq 0$

Because persistent shocks are defined to last at least two periods, they cannot be undone by next period's persistent shocks. Hence, subsequent persistent shocks must be uncorrelated:

(4) $E[\eta_{it}, \eta_{i,t-1}] = 0$

Finally, we use the identifying assumption that persistent shocks are uncorrelated with contemporaneous temporary shocks:

(5) $E[\eta_{it}, \varepsilon_{it}] = 0$

While this assumption cannot be tested, we will discuss below to what extent the main results hold if η_{it} and ε_{it} are not uncorrelated.

Estimation

The model is estimated on a four period panel using the methods of moments. The moment conditions for the variances of the transitory shocks are identified only for the second and third period. To derive them, it is useful to first take first differences of log consumption expenditure:

(6) $\Delta C_{it} \equiv C_{it} - C_{i,t-1} = \alpha_t + \eta_{it} + \varepsilon_{it} - \varepsilon_{i,t-1}$

Since all shocks have mean zero, the expectation of ΔC_{it} equals α_t. Hence, the covariance between two consecutive first differences is:

(7) $Cov[\Delta C_{i,t+1}, \Delta C_{i,t}] = E[(\eta_{i,t+1} + \varepsilon_{i,t+1} - \varepsilon_{i,t})(\eta_{it} + \varepsilon_{it} - \varepsilon_{i,t-1})] = E[-\varepsilon^2_{it}] = -\sigma^2_{\varepsilon,t},$

where the second equal sign makes use of restrictions (3), (4), and (5) above. The intuition is relatively simple: the only shock that two consecutive first differences have in common is the transitory shock of the period in which the first differences overlap.

In a four period panel, only the permanent shock that occurs between periods 2 and 3 is identified. Again the moment condition involves a covariance of 2 first differences:

(8) $\text{Cov}[(C_{i4} - C_{i1}), (C_{i3} - C_{i2})] = E[(\eta_{i4} + \eta_{i3} + \eta_{i2} + \varepsilon_{i4} - \varepsilon_{i1})(\eta_{i3} + \varepsilon_{i3} - \varepsilon_{i2})]$

$= E[\eta^2_3] = \sigma^2_{\eta 3,}$

where the second equal sign makes use of restrictions (3), (4), and (5) above. The intuition is quite straightforward: the permanent shock between periods 3 and 2 is the only thing that the shock between period 4 and 1 and the shock between period 3 and 2 have in common, because they are subject to different transitory shocks (which are uncorrelated).

With estimates of $\sigma^2_{\varepsilon 2}$, $\sigma^2_{\varepsilon 3}$ and $\sigma^2_{\eta 3}$, the other main parameters can be estimated easily. The variance of underlying consumption in periods 2 and 3 is:

(9) $\text{Var}[C_{i2}^*] \equiv \sigma^2_{C2*} = \sigma^2_{C2} - \sigma^2_{\varepsilon 2}$

(10) $\text{Var}[C_{i3}^*] \equiv \sigma^2_{C3*} = \sigma^2_{C3} - \sigma^2_{\varepsilon 3}$

where the variance of C_{it} is by σ^2_{Ct}. The correlation between the persistent shock, η_{i3}, and the underlying level of consumption, C_{i2}^*, is:

(11) $\rho = (\sigma^2_{C3*} - \sigma^2_{C2*} - \sigma^2_{\eta 3})/(2\ \sigma_{\eta 3}\ \sigma_{C2*})$

Finally, the mean C_{it} is denoted by μ_{Ct}. All standard errors are computed by bootstrapping the sample 100 times.

Table 1 contains the estimates of this model for log consumption and log income in Russia and Poland. These parameter estimates will be used in the next section to simulate the model. The main substantive findings will be discussed in later sections using the simulations. Nevertheless, Table 1 gives a nice preview of the findings. First, the variance of log consumption or income is about 2 to 3 times higher in Russia than in Poland, indicating a more unequal distribution in Russia. Second, the variance of income and consumption shocks is considerable in both countries, suggesting high levels of economic insecurity. Third, the variance of the transitory shocks ($\sigma^2_{\varepsilon 3}$) is much larger than the variance of persistent shocks ($\sigma^2_{\eta 3}$), indicating that most of the shocks will be undone within 12 months. Because the variance of the transitory shocks is a substantial fraction of the cross-sectional variance, disregarding the transitory component of income

or consumption substantially reduces our estimate of inequality. Disregarding the transitory component may be reasonable since many of the transitory shocks likely reflect measurement error.[4]

The four bottom rows of table 1 explore the sensitivity of the estimate of the fraction of persistent shocks to the identifying assumption that contemporaneous persistent and transitory shocks are uncorrelated. They show that a positive correlation between persistent and transitory shocks leads to an upward bias in the estimate of the fraction of persistent shocks.[5] Hence, in this case, a larger part of shocks is transitory than our estimate shows. Moreover, as long as the correlation between transitory and persistent shocks takes on plausible values (say between –0.2 and 0.2), the bias in the fraction of persistent shocks remains less than 4 percentage points.

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[4] To alleviate concerns that the transitory component is largely driven by purchases of lumpy items such as durables, we repeated the analysis with food expenditure instead of total expenditure (see appendix table A1). In Russia, log food expenditure has a higher variance than log total expenditure, both cross-sectionally and over time, while in Poland the opposite is the case. The higher variance of food expenditure in Russia is probably linked to the short recall period for food expenditure, namely one week. In both countries, however, the fraction of shocks that are persistent is roughly as high for food expenditure as total expenditure. Hence, the highly transitory nature of expenditure shocks cannot be solely attributed to occasional purchases of big-ticket items.

[5] Assuming that the covariance between ε_{it} and η_{it} is constant over time, the estimate of the variance of persistent shocks does not depend on the correlation between persistent and transitory shocks, λ. However, the estimate of the variance of transitory shocks does depend on this correlation. Equation (7) now becomes:

(7′) $\mathrm{Cov}[\Delta C_{i,t+1}, \Delta C_{i,t}] = -\sigma^2_{\varepsilon,t} - \lambda\, \sigma_{\varepsilon,t}\, \sigma_{\eta,t}$

This is a quadratic equation, which can be solved for $\sigma_{\varepsilon,t}$.

Table 1: Parameter Estimates

Parameter	Symbol	Russia 1994-1998 Consumption		Russia 1994-1998 Income		Poland 1993-1996 Consumption		Poland 1993-1996 Income	
Means of logs									
Period 1	μ_{C1}	8.129	(0.018)	7.834	(0.022)	6.231	(0.007)	6.218	(0.008)
Period 2	μ_{C2}	7.940	(0.017)	7.530	(0.024)	6.173	(0.008)	6.210	(0.010)
Period 3	μ_{C3}	7.777	(0.020)	7.325	(0.031)	6.204	(0.007)	6.271	(0.009)
Period 4	μ_{C4}	7.506	(0.020)	7.230	(0.022)	6.240	(0.007)	6.322	(0.010)
Variances of logs									
Period 1	σ^2_{C1}	0.678	(0.038)	0.736	(0.045)	0.227	(0.007)	0.335	(0.016)
Period 2	σ^2_{C2}	0.623	(0.023)	0.970	(0.058)	0.239	(0.007)	0.355	(0.016)
Period 3	σ^2_{C3}	0.769	(0.038)	1.699	(0.090)	0.240	(0.007)	0.338	(0.018)
Period 4	σ^2_{C4}	0.698	(0.029)	1.110	(0.065)	0.248	(0.007)	0.319	(0.014)
Variances of first differences of logs									
Period 2-1	$\sigma^2_{\Delta C2}$	0.678	(0.029)	1.138	(0.072)	0.174	(0.006)	0.321	(0.017)
Period 3-2	$\sigma^2_{\Delta C3}$	0.686	(0.026)	1.801	(0.112)	0.154	(0.006)	0.294	(0.022)
Period 4-3	$\sigma^2_{\Delta C4}$	0.785	(0.033)	1.950	(0.117)	0.161	(0.007)	0.293	(0.023)
Decomposition of shocks									
Var[persistent shock]	$\sigma^2_{\eta 3}$	0.059	(0.022)	0.130	(0.041)	0.022	(0.003)	0.028	(0.013)
Var[transitory shock 2]	$\sigma^2_{\varepsilon 2}$	0.256	(0.022)	0.560	(0.066)	0.065	(0.004)	0.135	(0.012)
Var[transitory shock 3]	$\sigma^2_{\varepsilon 3}$	0.371	(0.025)	1.111	(0.092)	0.067	(0.004)	0.131	(0.019)
Derived estimates									
Var[underlying level 2]	$\sigma^2_{C2^*}$	0.367	(0.030)	0.409	(0.048)	0.174	(0.005)	0.220	(0.015)
Var[underlying level 3]	$\sigma^2_{C3^*}$	0.398	(0.031)	0.588	(0.056)	0.172	(0.006)	0.207	(0.015)
Correlation[C^*_2 , η_3]	ρ	-0.094	(0.145)	0.106	(0.116)	-0.188	(0.047)	-0.265	(0.126)
Fraction persistent		0.137	(0.047)	0.105	(0.034)	0.244	(0.029)	0.178	(0.075)
Sensitivity of "Fraction Persistent" to the assumption that η_{it} and ε_{it} are uncorrelated.									
Frac. persist. if corr[η_{it}, ε_{it}]= 1.0		0.081		0.065		0.184		0.101	
Frac. persist. if corr[η_{it}, ε_{it}]= 0.2		0.120		0.093		0.225		0.154	
Frac. persist. if corr[η_{it}, ε_{it}]= -0.2		0.159		0.119		0.268		0.210	
Frac. persist. if corr[η_{it}, ε_{it}]= -1.0		0.439		0.269		0.564		0.756	

Note: All measures are for equivalent adults. The equivalence scale is household size to the power of 0.75 (θ=0.75). Data consist of balanced panels, 1993-1996 for Poland and 1994-1998 for Russia. Fraction persistent is the fraction of the shock between period 2 and 3 that is persistent. This fraction is defined by the ratio of the variance of the persistent shock to the variance of the total shock between period 2 and 3.

Simulations

Because the variances of the transitory shocks for the first and last periods are not identified, the paths of persistent and transitory income and expenditure can only be simulated for periods 2 and 3. While the estimation of the variances of the various

shocks did not rely on any distributional assumptions, the simulations assume log normal distributions of shocks, income and expenditure.

The log of persistent consumption for period 2 is simulated by:

$$(12) \quad \tilde{C}_2^* \sim N(\hat{\mu}_{C_2}, \hat{\sigma}_{C_2}^2 - \hat{\sigma}_{\varepsilon_2}^2)$$

where the tilde indicates a simulated variable and the carets indicate estimated parameters. The transitory shock for period 2 is simulated by:

$$(13) \quad \tilde{\varepsilon}_2 \sim N(0, \hat{\sigma}_{\varepsilon_2}^2)$$

and used to simulate the log of total period 2 consumption:

$$(14) \quad \tilde{C}_2 = \tilde{C}_2^* + \tilde{\varepsilon}_2$$

To allow for correlation with the level of persistent consumption, the persistent shock is simulated by:

$$(15) \quad \tilde{\mu}_2 = \hat{\rho} \frac{\hat{\sigma}_{\eta_3}}{\hat{\sigma}_{C_2^*}} \left(\tilde{C}_2^* - \mu_{C_2^*} \right) + \tilde{\xi}$$

where

$$(16) \quad \tilde{\xi} \sim N(0, (1 - \hat{\rho}^2)\hat{\sigma}_{\eta_3}^2)$$

Persistent consumption in period 3 is found by adding the persistent shock and the time-trend to persistent consumption in the previous period:

$$(17) \quad \tilde{C}_3^* = \tilde{C}_2^* + \hat{\alpha}_3 + \tilde{\mu}_3$$

where $\hat{\alpha}_3 = \hat{\mu}_{C_3} - \hat{\mu}_{C_2}$. Finally, total consumption is found by adding the transitory shock for period 3:

$$(18) \quad \tilde{C}_3 = \tilde{C}_3^* + \tilde{\varepsilon}_3$$

where the transitory shock is simulated by:

$$(19) \quad \tilde{\varepsilon}_3 \sim N(0, \hat{\sigma}_{\varepsilon_3}^2)$$

The results of the simulated model are used in the next sections to present the main findings.

Measurement Error and Instruments

Most researchers recognize that measured equivalent consumption expenditure is only a rough proxy for the standard of living of a household. This raises the question of

whether the differences in equivalent expenditure reflect true differences in the living standards of households or whether these differences merely reflect inaccuracies of the proxy. In principle, this question can be answered if we can find two instruments (see also McCulloch and Baulch, 2000). These instruments need to be correlated with underlying living standards, but also need to be uncorrelated with measurement error in measured equivalent expenditure. The intuition is simple: common movements of all three proxies indicate changes in the underlying living standards while the deviations of one proxy from the other two indicates measurement error in this proxy. This information can then be used to calculate movements in the true living standards as well as the amount of measurement error in each of the proxies.

More formally, let the true, but unobserved, living standards of household i be denoted by H_i (say, for happiness). Consumption expenditure, C_i is a noisy proxy for living standards:

(20) $C_i = H_i + u_i$

where u_i is an error term that is uncorrelated with H_i and that has a mean of zero and a variance of σ^2_u. At this point, we cannot tell whether movements in C_i are due to movements in true living standards, H_i, or simply due to movements in the error term u_i.

Let the two additional proxies for living standards be denoted by X_i and Y_i, where,

(21) $X_i = \alpha_0 + \alpha_1 H_i + v_i$

(22) $Y_i = \beta_0 + \beta_1 H_i + w_i$

Both errors terms, v_i and w_i, must be uncorrelated with H_i. Their means are zero and their variances denoted by σ^2_v and σ^2_w. Moreover, all three proxies must be unrelated in the sense that their error terms are statistically independent: $E[u_i\, v_i.] = 0$, $E[u_i\, w_i.] = 0$ and $E[v_i\, w_i] = 0$.

To find the variance of underlying living standards, σ^2_H, we first need to calculate the covariances between the proxies:

(23) $Cov[C_i, X_i] \equiv \sigma_{CX} = \alpha_1\, \sigma^2_H$

(24) $Cov[C_i, Y_i] \equiv \sigma_{CY} = \beta_1\, \sigma^2_H$

(25) $Cov[X_i, Y_i] \equiv \sigma_{XY} = \alpha_1\, \beta_1\, \sigma^2_H$

These three equations are solved for σ^2_H:

(26) $\sigma^2_H = \sigma_{CX}\,\sigma_{CY} / \sigma_{XY}$

Finally, the fraction of the variance in measured equivalent consumption that is due to measurement error is calculated as:

(27) *Fraction measurement error in C* $= (\sigma^2_C - \sigma^2_H) / \sigma^2_C$

The methodology to estimate the variance of changes in underlying living standards is analogous:

(28) $\sigma^2_{\Delta H} = \sigma_{\Delta C,\Delta X}\,\sigma_{\Delta C,\Delta Y} / \sigma_{\Delta X,\Delta Y}$

where $\sigma_{A,B}$ denotes the covariance between A and B.

The first instrument used is a measure of subjective living standards. In the Russian data, subjective living standards are measured by the question: *Please imagine a 9-step ladder where on the bottom,(the first step), stand the poorest people, and on the highest step, (the ninth), stand the rich. On which step are you* today? Lokshin and Ravallion (1999) show that total household income is a significant predictor of the answer to the subjective welfare question, although its explanatory power is low. In the Polish data, living standards are measured by the question: *How would you rate the general material si uation of your household? Very good, good, average, rather bad or bad.* These answers are converted into a 5 point linear scale. By definition, this instrument should be related to underlying living standards. It seems unlikely that it is correlated with measurement error in equivalent consumption.

The second instrument is equivalent household income. While this instrument is related to underlying living standards, one may worry whether measurement error in equivalent income is independent of measurement error in equivalent consumption. For example, a misspecified equivalence scale would cause a correlation between these error terms. Similarly, households who willingly underreport income (e.g. due to forgetfulness or for fear of taxation), might also underreport consumption. Hence, this second instrument is chosen by lack of a better alternative.

Fortunately, it is possible to deduce how a correlation between measurement error in income and consumption would affect the results. Such a correlation would lead to an upward bias in σ_{CY} (and the analogous expression for first differences). This would lead us to overestimate the fraction of the variance that can be explained by movements in underlying living standards and to underestimate the part due to measurement error.

Hence, all the estimates for fractions of measurement error should probably be treated as lower bounds.

Table 2 presents the IV estimates of the fraction of the variance that is due to measurement error. These results will be discussed in more detail in the subsequent sections. Nevertheless, the table already shows that measurement error is responsible for a large fraction, typically 30%-60%, of cross-sectional variance. Measurement error accounts for an even larger share, generally around 55%-80%, of the variance of income and expenditure shocks. Measurement error seems to be about as important for consumption as for income and is generally higher in Russia than in Poland.[6]

Table 2: Instrumental Variable Estimates of the Fraction Measurement Error

	Russia 1994-1998				Poland 1993-1996			
Fraction measurement error in:	Consumption		Income		Consumption		Income	
Logs, Period 1	0.447	(0.073)	0.564	(0.064)	0.346	(0.023)	0.402	(0.035)
Logs, Period 2	0.531	(0.055)	0.676	(0.055)	0.386	(0.024)	0.363	(0.036)
Logs, Period 3	0.517	(0.049)	0.561	(0.057)	0.401	(0.022)	0.332	(0.039)
Logs, Period 4	0.320	(0.056)	0.618	(0.043)	0.381	(0.021)	0.285	(0.033)
Log difference, period 2-1	0.751	(0.098)	0.797	(0.094)	0.682	(0.051)	0.534	(0.084)
Log difference, period 3-2	0.746	(0.413)	0.869	(0.181)	0.710	(0.039)	0.546	(0.073)
Log difference, period 4-3	0.779	(0.111)	0.699	(0.190)	0.728	(0.046)	0.472	(0.094)

Note: All measures are for equivalent adults. The equivalence scale is household size to the power of 0.75 (θ=0.75). Data consist of balanced panels, 1993-1996 for Poland and 1994-1998 for Russia.

4. Underlying Inequality

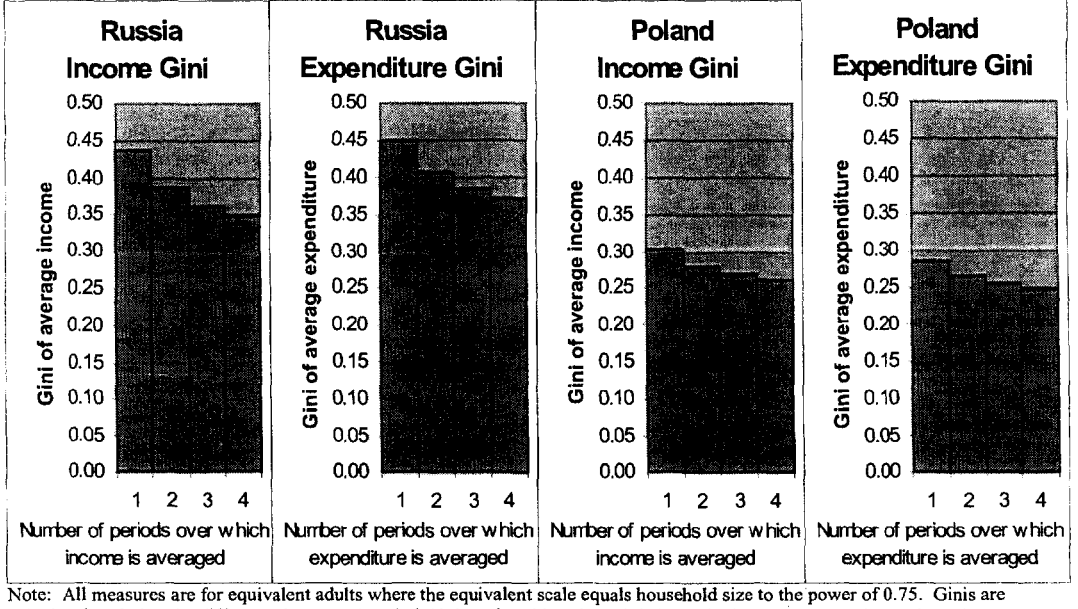
It is common to measure inequality in living standards by inequality in income or expenditure across individuals in a given month. However, income or expenditure in a given month is only an imprecise measure of the living standard of a household. Income or expenditure could be misreported or could reflect transitory events. Whenever measured income (or expenditure) is an imperfect indicator of true living standards, the inequality in measured incomes or expenditures will exceed the inequality in underlying

[6] We find the same pattern of measurement in food expenditure, though measurement error in food expenditure tends to be higher than that in total expenditure. See appendix table A1 for details.

living standards.

The first way of reducing the role of transitory events and measurement error is to examine inequality in average incomes (Shorrocks, 1978). For each family, we calculate 4 measures of their living standards: (i) their income in the current month, (ii) the average of their incomes in the current month and 12 months ago, (iii) the average of their incomes in the current month, 12 months ago, and 24 months ago, and (iv) the average of their incomes in the current month, 12, 24 and 36 months ago. More idiosyncratic components of income and measurement error will be averaged out as we average over more periods, but method also averages out some true mobility – movements in the underlying level of material well-being. Nevertheless, the inequality of average income over four periods is likely to be a better approximation of underlying inequality than the one based on income in a single month. Figure 1 shows how inequality, as measured by the Gini coefficient, declines as we average income or expenditure over more periods. In Russia the Gini drops by about 20% to 25% when income or expenditure is averaged over 4 periods. The relative drop in Poland is smaller,

Figure 1: Gini Drops when Income or Expenditure is Averaged over Time



Note: All measures are for equivalent adults where the equivalent scale equals household size to the power of 0.75. Ginis are calculated such that the difference between 1 period Ginis and multi-period Ginis is solely due to the averaging and not due to any changes in inequality during the years for which the Ginis are calculated. Data consist of balanced panels, 1993-1996 for Poland and 1994-1998 for Russia. Standard errors on the Ginis are less than 0.010 and standard errors on the differences in Ginis are less than 0.005.

about 15%. Hence, the difference between inequality in Russia and Poland becomes smaller when we average incomes or expenditure over 4 periods rather than looking at a single period. Whether the Gini in Russia drops more because Russians are more mobile or because incomes and expenditures are measured with more noise is explored below.

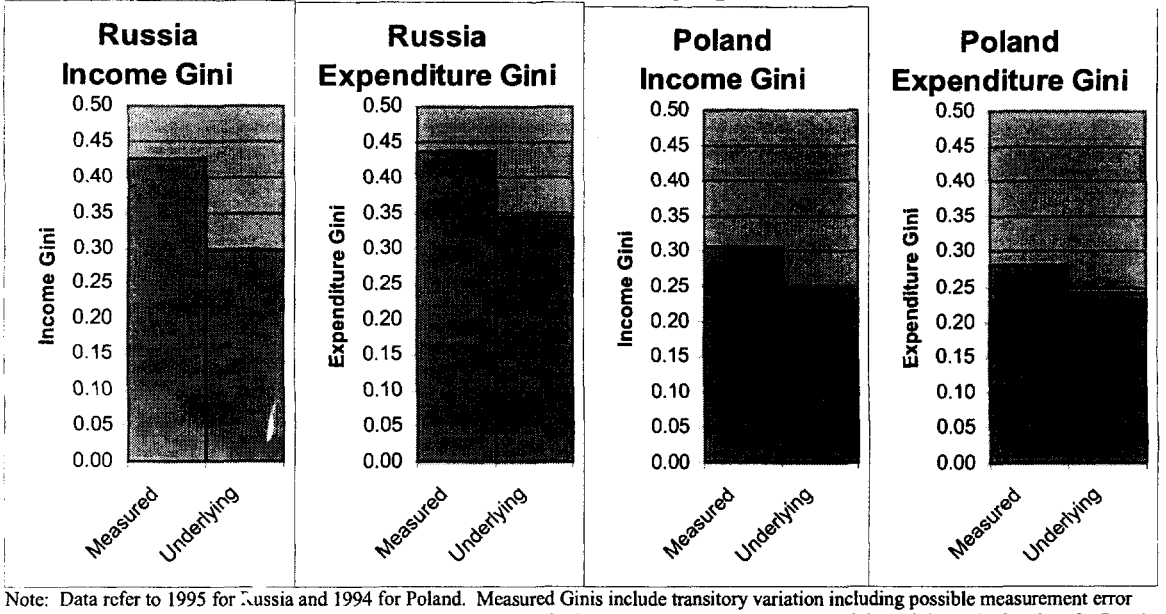
The OECD (1997) examined by how much the Gini of earnings inequality dropped in 6 OECD countries when weekly or monthly earnings of full-time workers are averaged over a 4 year period.[7] While earnings of full-time workers are not strictly comparable to equivalent income or expenditure, it is nevertheless remarkable that in these OECD countries the Gini coefficient only dropped by 3 to 5 percent. Rutkowski (1999) performed a similar calculation for Hungary and found that the Gini dropped by 8.2% when monthly earnings are averaged over a 5 year period. In contrast, Galasi (1998) finds the Gini of annual per capita household income in Hungary dropped by 11.7% when incomes are averaged over a 5 year period.[8] This suggests that the relatively low reductions in the Ginis in the calculations using earnings may in part be related to the focus on a sample of continuously employed full-time workers. Gibson, Huang and Rozelle (1999) calculated Gini coefficients for a sample of 232 Chinese urban households using both monthly and annual household expenditure. They find the Gini based on monthly expenditure is about 50% to 80% higher than the one based on annual expenditure, indicating that monthly expenditures are subject to many shocks that get averaged out over the year.

The second approach removes any transitory component (including measurement error) in income using the methodology described formally in the previous section. The main assumption of this methodology is that the income or expenditure distribution can be approximated well by a log normal distribution. The intuition, however, can be explained easily with the fashion metaphor. We measure the variety in each person's wardrobe by examining how much the quality of this person's clothes vary from day to day. When this day-to-day variation is higher, the quality of the outfit worn on any particular day more likely reflects an idiosyncratic choice rather than the underlying

[7] The countries examined are Denmark, France, Germany, Italy, the United Kingdom and the United States, and the data covers the period 1986-1989.

quality of that person's wardrobe. Once we have measured how much variety there is (on average) in each person's wardrobe, we assume that everybody has exactly the same wardrobe and predict how much inequality we would find solely due to idiosyncratic choices. To the extent that measured inequality is greater than this predicted amount of inequality, it must be the case that not everybody's wardrobe is equal. Moreover, one can calculate the amount of inequality that must exist in the quality of wardrobes.

Figure 2: Measured versus Underlying Gini Coefficients



Note: Data refer to 1995 for Russia and 1994 for Poland. Measured Ginis include transitory variation including possible measurement error while underlying Ginis are purged of any transitory variation. Standard errors on the measured and underlying Ginis are 0.02 or less for Russia and 0.01 or less for Poland. Differences between measured and underlying Ginis are highly statistically significant in all cases.

We apply this methodology to the income and expenditure distribution in Russia and Poland. For the purpose of living standards, we define any component of income or expenditure that is expected to disappear within 12 months as transitory. These transitory components are the economic equivalent of the idiosyncratic choice of what to wear on any given day. The underlying component is the component of income or expenditure that is expected to last at least 12 months (perhaps longer, but this cannot be inferred from the data). One can interpret this component as the income or expenditure that you

[8] Our own calculations, using the Tarki Panel for 1994-1997, yielded a 11.3% drop in Hungary's Gini for income per equivalent adult when income was averaged over 4 years. The equivalence scale equals household size raised to the power of 0.75.

can expect to get in 12 months from now. This is equivalent to the quality of one's wardrobe, because the expected quality of an outfit randomly chosen from your wardrobe is equal to the average quality of outfits in your wardrobe. Figure 2 shows measured and underlying income and expenditure inequality in Russia and Poland.

In Russia underlying income inequality is about 30% lower than income inequality in a given month. This means that much of the income inequality in a given month is due to transitory events and measurement error that increase or decrease a family's income for that month. In Russia, underlying expenditure inequality is about 20% lower than expenditure inequality in a given month. In Poland, the differences between underlying and monthly inequality are somewhat smaller – about 20% for income inequality and about 15% for expenditure inequality. Because the role of transitory events and measurement error is larger in Russia than in Poland, the differences in inequality between Russia and Poland become smaller when we consider underlying inequality rather than measured inequality.

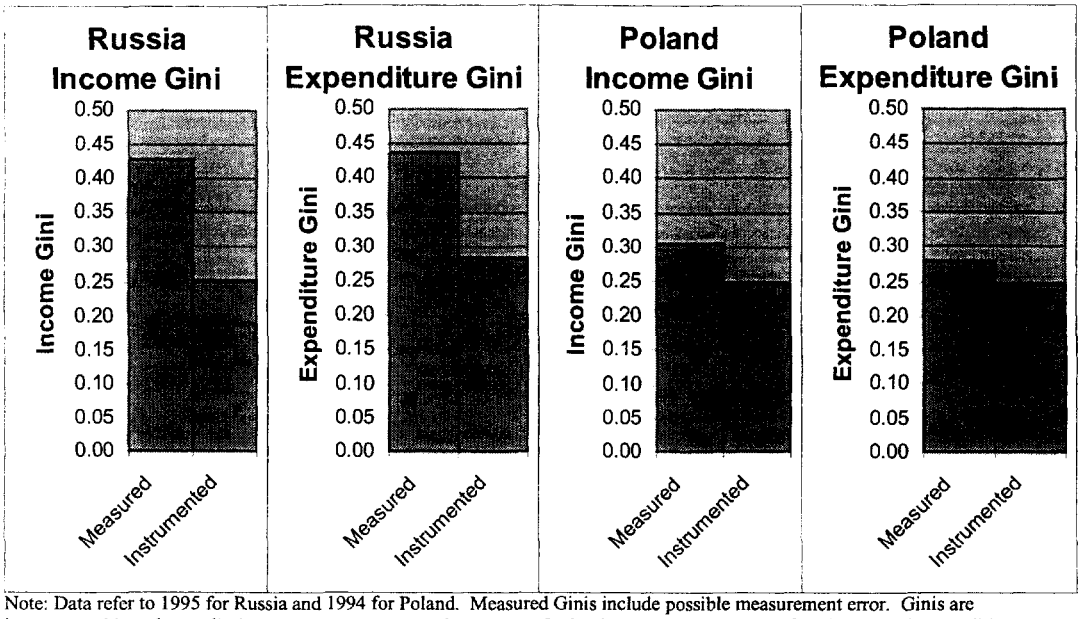
Finally, we try to remove measurement error from income and expenditure by instrumenting them. Instrumenting differs from the previous method in two ways. First, instrumenting does not remove transitory shocks to living conditions. Second, while the previous method only removed transitory measurement error, instrumenting will remove measurement error whether it is transitory or not. The methodology of instrumenting is described in detail in the previous section, but two important assumptions need to be emphasized. First, the methodology assumes lognormality of the expenditure and income distribution. Second, it assumes that measurement error in income, expenditure and subjective living conditions are uncorrelated. To the extent that measurement error in expenditure and income are correlated, it will bias the instrumented Gini upwards.

As figure 3 shows, instrumenting indicates that measurement error contributes substantially to the Gini coefficients, especially in Russia. After instrumenting, the Ginis for Russia and Poland become quite similar – around 0.25. Taken at face value, this result implies that the difference in the measured inequality between Russia and Poland is purely driven by differences in the data quality between those countries.

However, the instrumenting relies on a number of seemingly reasonable but untestable assumptions, most notably that the errors in the instruments are uncorrelated

with each other. Hence, this result should probably be taken as an indication that differences in data quality are largely, but probably not entirely, responsible for all of difference in inequality between Russia and Poland.

Figure 3. Instrumenting Ginis to Eliminate Measurement Error



Note: Data refer to 1995 for Russia and 1994 for Poland. Measured Ginis include possible measurement error. Ginis are instrumented in order to eliminate measurement error. Instruments for log income are a measure of subjective living conditions and log expenditure. Instruments for log expenditure are a measure of subjective living conditions and log income. The calculations assume log normal income and expenditure distributions and assume that measurement error in income, expenditure and subjective living conditions are independent. To the extend measurement error is correlated, the instrumented Ginis are biased upwards. Standard errors are less than 0.02 for both measured and instrumented Ginis. Differences between measured and instrumented Ginis are highly statistically significant in all cases.

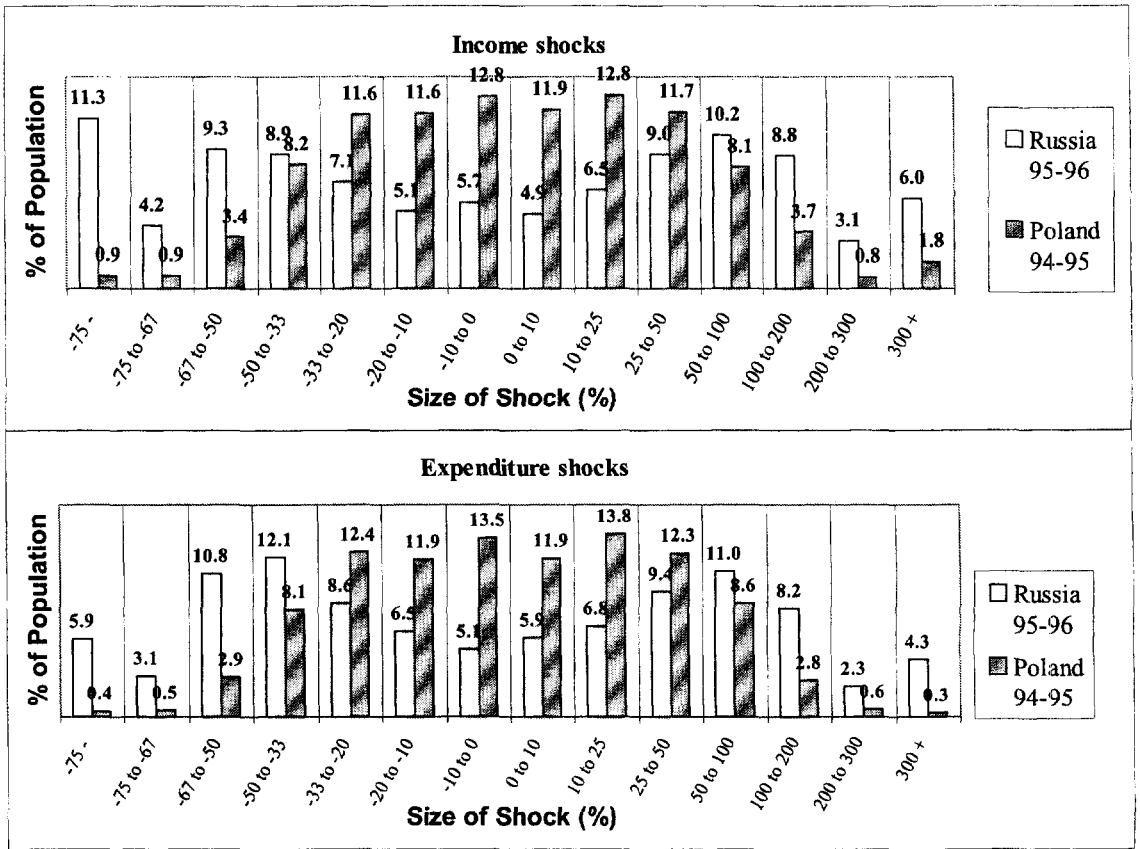
5. Economic Security

Following families over time also allows us to examine the stability, or security, of their economic situation. Figure 4 shows for Russia and for Poland the distribution of income and expenditure shocks, measured as percentage changes between the reference month and the same month one year later.[9] These percentage changes are reported in deviation of the national mean. The figure shows that families experience huge

[9] The reference month is the month in which the household was observed in wave 2 of the survey. In Russia, wave 2 was fielded in November and December of 1995 while in Poland wave 2 was fielded between January and December of 1994.

fluctuations in their incomes, as reported in the household surveys. For example, over

Figure 4: Distribution of Shocks



Note: The figure shows the distribution of the change in real equivalent income and real equivalent expenditure between the reference month and the same month one year later. The reference month is the month in which the household was observed in wave 2 of the survey. In Russia, wave 2 was fielded in November and December of 1995 while in Poland wave 2 was fielded between January and December of 1994. Income and expenditure shocks are in deviation of the national mean. The mean income shock was –4.0% in Russia and 1.8% in Poland while the mean expenditure shock was –8.3% in Russia and 4.1% in Poland. Since categories have different sizes, these plots do *not* show distribution functions.

40% of the population in Russia either sees their income increase to more than double, or fall to less than half, while in Poland this fluctuation happens to slightly more than 10% of the population. Fluctuations in reported expenditures are only slightly smaller than those in incomes.

At first blush, these fluctuations in economic fortunes appear to be huge, but many of these changes might reflect transitory events that have a relatively small effect on underlying well-being of the population. In terms of our fashion metaphor, suppose we observe an individual who usually wears cheap clothes but who today wears expensive ones. This could be a persistent change that affects her underlying fashion

quality – she got rid of her old cheap wardrobe and bought all new expensive clothes. Or it could reflect a transitory effect – the wardrobe stayed the same, and she merely happened to wear today her only expensive item. Moreover, many of the fluctuations might not reflect real events but simply measurement error in the data. Below, we investigate the role of transitory shocks and measurement error more thoroughly.

Suppose we observe someone whose income was steady until last year, but who experiences a change in this year's income (as compared to last year). The persistent component of the change is the fraction of the change that will last at least until next year, while the remainder is transitory. We estimate that 90% of the variance of income shocks is transitory while 82% is transitory in Poland. The figures for expenditure shocks are 86% and 76%. This means that shocks are largely transitory, i.e. their effect will be largely undone within a year. For example, a Russian family who used to be earning 2000 Rubles per month and whose income increased to 3000 Rubles in the current month, should expect their income to fall back to 2100 Rubles in the same month one year from now. In other words, only 10% of the positive income shock of 1000 Rubles will persist for at least a year while the remaining 90% will disappear before that.

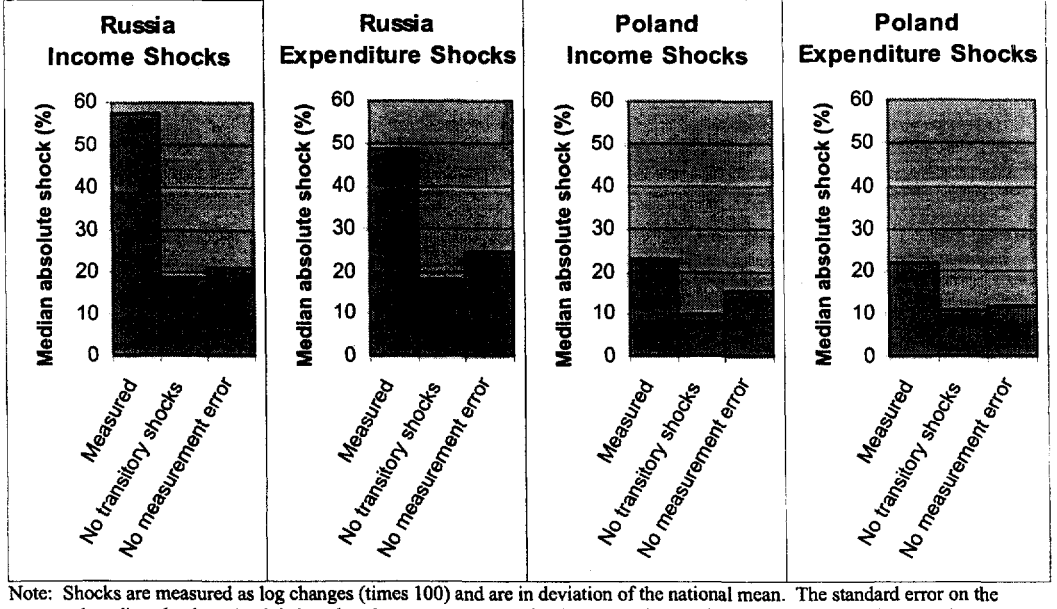
Using the instrumental variable approach to find out what fraction of the variance of the shocks is caused by measurement error, we find that in Poland about 55% of the variance of income shocks and 70% of the variance of expenditure shocks can be traced to measurement error. For Russia, we estimate that about 80% of the shocks is due to measurement error, but this estimate is very imprecise.

Since our estimates indicate that a substantial fraction of the shocks are transitory or are due to measurement error, Figure 5 shows the size of shocks with and without the transitory component and measurement error. We measure the size of shocks by the median absolute deviation. In other words, we first calculate the absolute size of the shock (in percentage terms), and then find the median. Figure 5 shows that if we take the data at face value, the median Russian faced an income shock of about 57% (up or down). However, if we only consider the permanent component, the median absolute shock drops to about 19%, while if we remove measurement error, it drops to about 21%. The pattern for expenditure shocks in Russia is similar. Measured income and expenditure shocks are smaller in Poland, but there too, removing the transitory

component or measurement error leads to substantial drops. Hence, the figure indicates that in both Russia and in Poland, the living standards are more stable than the measured data would indicate. Nevertheless, even after correcting for measurement error or transitory shocks, individuals in Poland and especially in Russia face considerable fluctuations in living standards.

Table A2 in the appendix shows the size of expenditure shocks as well as their breakdown in transitory and permanent components for different demographic groups in Poland. Table A3 shows the same information for Russia. The tables show that for most demographic groups, neither the size nor the composition of the shocks is significantly different from the overall mean. However, there are a few notable exceptions. Both in Russia and in Poland, individuals with access to land face larger shocks that tend to be less permanent, but these differences are only statistically significant in Poland. In Poland, the size of the shock (as a fraction of expenditure) increases with income, while it displays a U-shaped pattern in Russia. In both countries, households with household heads aged 51-64 with higher education face the smallest shocks, but this difference is only significant in Poland.

Figure 5: Median absolute shocks after correction for transitory component and measurement error.



Note: Shocks are measured as log changes (times 100) and are in deviation of the national mean. The standard error on the measured median absolute shock is less than 2 percentage points in all cases. The standard errors on the median absolute shock without the transitory component are about 10 for income and expenditure shocks in Russia and about 5 for shocks in Poland. The standard errors of the median absolute shock without measurement error are about 30 and 5 respectively.

6. Mobility and Underlying Poverty

In face of the sizeable income and expenditure shocks, one might wonder how long-lasting economic positions are. Do the rich generally remain rich and the poor remain poor, or do individuals frequently switch positions? The degree to which individuals keep their position in the income distribution can be measured by the correlation between this period's income and the next period's. Table 3 shows these correlations for income and expenditures in Russia and Poland.

Table 3. Correlations in Income and Expenditure

	Russia		Poland	
	Income	Expenditure	Income	Expenditure
A. Traditional correlations				
Current month and 12 months later	0.335	0.479	0.535	0.627
Current month and 24 months later	0.254	0.431	0.549	0.626
Current month and 36 months later	..	..	0.457	0.569
Current month and 48 months later	0.266	0.380	..	..
B. Underlying correlations				
Correlation between *underlying* income/expenditure in current month and 12 months later	0.884	0.924	0.934	0.937
Memo: "traditional" correlation over the same time period.	0.338	0.510	0.575	0.678

Notes: Equivalent income and equivalent expenditure are measured in logarithmic form. In panel A, the current month is taken from the first of the 4 waves of the data. The first wave of the Russian data was collected in November/December of 1994 and the first wave of the Polish data was collected between January and December of 1993. Correlations between persistent income/expenditure can only be calculated for waves 2 and 3 of the data. In both countries, wave 2 was collected 1 year after the first wave, and wave 3 was collected 2 years after the first wave. Standard error for these correlations are generally around 0.02 to 0.03.

Panel A of Table 3 shows the correlation between current log income or log expenditure, and its value in future periods. The correlation between a family's current economic situation and that 12 months from now is slightly less than 50% in Russia and somewhat more than 50% in Poland. This would suggest a lot of churning. However, these correlations fall only very little if we move out one, two or three extra years. Does this mean that the churning has largely ceased after the first year? The explanation for this pattern of correlations is that the correlation between any two years is less than unity for two reasons: (i) the transitory shocks that occur in each of the two years, and (ii) the underlying amount of churning – the persistent shocks between the two years. Whether

we compare the correlation between incomes that lie one, two or three years apart, the amount by which the correlation is reduced below unity due to transitory shocks is about the same. Hence, the amount by which these correlations fall as we compare incomes that lie one year apart to incomes that lie 2 years apart provides a measure of the amount of underlying churning that takes place. This idea can be formalized to calculate the correlation between the underlying incomes in two adjacent years. As panel B of Table 3 shows, this correlation ranges from 88% for incomes in Russia to 94% percent for expenditure in Poland, suggesting that there is relatively little switching of underlying economic fortunes. Mobility in expenditure shows, by and large, the same picture.

Perhaps the fashion metaphor can further illustrate the mobility pattern. The traditional correlations measure to what extent people who wear nice clothes today also wear nice clothes on a given day one year from now. Here we see relatively low correlations because one day people may wear a nice outfit from their wardrobe while the next year they might wear some old clothes from the same wardrobe. While the traditional correlations measure people's positions on the fashion hierarchy by the clothes they wear on a given day, the persistent correlations measure their fashion position by the average quality of their wardrobe. Hence, high persistent correlations indicate that people who had a nice wardrobe one year ago, still, by and large, have nice wardrobes this year. By this measure, few people switch ranks on the fashion hierarchy.

An especially important form of mobility is the extent to which the poor can escape poverty. To facilitate comparisons of mobility in and out of poverty in Russia and Poland, we chose a poverty line such that in each year 20% of the population in each country is considered poor. We present results for poverty based on equivalent household expenditures, but the findings for income based poverty are qualitatively the same. We can classify someone as poor based on their measured expenditure in a given month ("traditionally measured" poverty) or based on the underlying component of their expenditure in that month ("underlying" poverty). This is analogous to determining someone's fashion deprivation by the clothes he wears that day or by the clothes in his wardrobe. Table 4 shows the flows into and out of poverty for measured and underlying poverty for Russia and Poland.

Table 4. Flows Into and Out of Poverty

A. Movements in "Traditionally Measured" Poverty

Russia (95-96)			Poland (94-95)		
Poverty status 12 months ago	This month's poverty status		Poverty status 12 months ago	This month's poverty status	
	Poor	Non-poor		Poor	Non-poor
Poor	44.7%	55.3%	Poor	55.3%	44.7%
Non-poor	13.8%	86.2%	Non-poor	11.2%	88.8%

B. Movements in "Underlying" Poverty

Russia (95-96)			Poland (94-95)		
Poverty status 12 months ago	This month's poverty status		Poverty status 12 months ago	This month's poverty status	
	Poor	Non-poor		Poor	Non-poor
Poor	79.4%	20.6%	Poor	80.2%	19.8%
Non-poor	5.2%	94.8%	Non-poor	4.9%	95.1%

Note: Underlying poverty measures are based on simulations assuming log normality of expenditure distributions. Poverty is measured by equivalent expenditure where the equivalence scale is household size raised to the power of 0.75. The poverty line is such that the poverty rate is 20% in all years. Measured poor are those whose equivalent expenditure in the current year falls below the poverty line. Underlying poor are those whose equivalent expenditure purged of transitory shocks falls below the poverty line. Standard errors are never larger than one fifth of the transition probabilities.

Panel A of Table 4 shows movements in and out of poverty as measured by expenditures in the current month while panel B shows movements based on individuals' underlying poverty status. Both panels show that mobility in and out of poverty is markedly higher in Russia than in Poland. The contrast between traditionally measured poverty flows and underlying poverty flows is even stronger. According to the traditional measure, 55.3% of the Russian poor can expect to escape poverty by the next year, while only 20.6% of those in underlying poverty can expect to escape poverty. In Poland, these figures are 44.7% and 19.8% respectively. Hence, a large fraction of the movements in and out of poverty are not related to persistent changes in economic fortunes, but merely reflect one-time transitional shocks affecting either expenditure this month or expenditure 12 months ago. When poverty is defined by the lowest quintile in the per capita income distribution, Galasi (1998) finds that in Hungary 40.5% of the poor in 1994 (according to the traditional measure) can expect to escape poverty by the next year, which is similar to the figure found for Poland.

In Poland, for example, 44% of those who escape poverty according to the traditional measure, are individuals whose persistent expenditure remained above the

poverty line, but who experienced a transitional negative shock in the previous period.[10] They are like people who have a perfectly nice wardrobe at home, but just happened to wear old clothes yesterday. Similarly, 33% of those who escape poverty according to the traditional measure are individuals whose persistent expenditure remained below the poverty line, but who experience a transitional positive shock in the current month. The fact that their persistent expenditure lies below the poverty line means that they would expect to be poor again in the following period. They are like people who have very old clothes in their wardrobe, but happened to wear their only presentable item today. Only 18% of those who escape poverty according to the traditional measure also saw their underlying poverty status rise above the poverty line.[11]

These findings also hold up if we examine extreme poverty, defined as the poorest 10%, rather than poverty defined as the lowest 20%. According to the traditional measure, 66.8% of extremely poor Russians escape extreme poverty within 12 months. However, only 28.9 of those who are poor according to their underlying consumption level escape extreme poverty within a year. For Poland, these figures are 53.7% and 24.5%. Hence, while many of those in extreme poverty may seem to escape extreme poverty, many of these escapes reflect measurement error or transitory shocks. Less than a third of the extreme poor will find their underlying consumption level rise above the poverty line within a year.

7. Underclass

Has an underclass of people living for prolonged periods in poverty emerged? A common way of addressing this question is by finding the fraction of the population that is poor in all periods of the survey. Panel A of Table 5 shows these fractions for income and expenditure poverty in Russia and Poland. As the table shows, around 3% of the population is poor in all 4 periods in Russia while the comparable figure lies around 5.5% in Poland. Based on these figures, the underclass seems small in both countries. Galasi

[10] The 4x4 joint probability distributions of underlying and measured poverty in the current period (4 possibilities), and underlying and measured poverty 12 months ago (4 possibilities) are presented in Table A4 in the appendix. The probabilities reported in the text are derived from this table.

[11] The remaining 5% consist of those whose underlying poverty status fell below the poverty line but whose traditionally measured status rose above it

(1998) finds that 6.5% of Hungarians have per capita incomes in the lowest quintile in all 5 years, indicating that persistent poverty in Hungary may be slightly higher than in Poland.

Table 5. Poverty and Underclass

	Russia		Poland	
	Income	Expenditure	Income	Expenditure
A. Fractions based on measured poverty				
"Always" poor (4 out of 4)	2.2%	3.4%	5.3%	5.9%
"Sometimes" poor (1, 2 or 3 times out of 4)	45.4%	41.9%	33.5%	31.6%
"Never" poor (0 times out of 4)	52.4%	54.7%	61.2%	62.5%
B. Fraction based on simulation using underlying poverty transition probabilities				
"Always" poor (4 out of 4)	7.4%	10.0%	9.9%	10.3%
"Sometimes" poor (1, 2 or 3 times out of 4)	28.2%	21.8%	22.0%	21.0%
"Never" poor (0 times out of 4)	64.3%	68.2%	68.1%	68.7%
C. Memo Items				
Probability of remaining in underlying poverty	0.720	0.794	0.791	0.802
Probability of remaining out of underlying poverty	0.930	0.948	0.948	0.951
Mean absolute deviation of transitory shock (in %)	54.3%	45.3%	20.9%	19.2%

Notes: Income and expenditure are adjusted for household size using an equivalence scale that equals household size raised to the power of 0.75. The poverty line is set such that in each year 20 percent of the population is poor.

Care needs to be taken, however, in interpreting such figures (see Jalan and Ravallion, 1998, and Baulch and Hoddinott, 2000). First, by construction, the underclass will shrink as the number of periods in the dataset increases. Second, this measure of underclass is very sensitive to transitory shocks and measurement error. A person whose underlying measure of well-being is consistently below the poverty line may occasionally appear as non-poor due to a transitory shock or measurement error. Hence, in countries with more transitory shocks and measurement error, the size of the underclass, as traditionally measured, will appear to be smaller than it really is. To illustrate this point, we simulate the fraction of the population whose underlying consumption or income measure is below the poverty line in all four periods using the transition probabilities of underlying poverty. These results are shown in panel B of Table 5. According to this simulation, the underclass in Russia is 7% to 10% of the population or about 3 times the size of the underclass based on measured poverty. The simulation shows that about 10%

of the Polish population is in underlying poverty in all 4 periods. It is especially instructive to compare the size of the underclass based on expenditure in Russia to the one based in income in Poland (columns 2 and 3). According to traditionally measured poverty, the underclass is much smaller in Russia (3.4%) than in Poland (5.3%), while according to underlying poverty, the sizes are almost identical (10.0% in Russia and 9.9% in Poland). This difference is explained by the difference in the size of the transitory shocks, which averages 45.3% for expenditure in Russia but only 20.9% for income in Poland.

Since the size of the underclass as defined by living in poverty for 4 consecutive years is sensitive to transitory shocks and measurement error, we define the underclass as those whose average expenditure over 4 years falls below a given threshold. This corresponds to Jalan and Ravallion's (1998) definition of the Chronic poor. Tables 6 and 7 show the poverty rates by demographic characteristics for three types of poverty: (i) a "traditional poverty" measure – the lowest quintile of equivalent expenditures in the base period; (ii) the "broad underclass" – the lowest quintile of average equivalent expenditures over 4 years; and (iii) the "severe underclass" – the lowest decile of average equivalent expenditure over 4 years. Table 6 shows the comparison for Poland. It shows that for most demographic subgroups, the probability of traditional poverty is not significantly different from the probability of belonging to the broad underclass (see the t-statistics in column 7). When there is a significant difference, the probability of belonging to the broad underclass is higher than the probability of traditional poverty if and only if the probability of traditional poverty for that group was higher than average. In other words, differences in poverty rates across subgroups become somewhat more pronounced. Comparing the extreme underclass to the broad underclass, we find differences in poverty rates again become more pronounced. Demographic groups who are overrepresented in the broad underclass are even more overrepresented in the extreme underclass (see t-statistics in column 11). The pattern for Russia, reported in Table 7, is similar except that fewer differences are statistically significant. Hence, it seems that a poverty profile based on cross-sectional data can serve as a reasonable guide to a poverty profile of chronically poor: generally speaking, demographic subgroups that are

overrepresented among the poor as measured in a cross-section are likely to be even more strongly overrepresented among the Chronic poor.

8. Conclusion

This paper tried to distinguish underlying inequality and mobility in two transition countries for inequality and mobility driven by transitory shocks or measurement error. This approach yielded three main findings: First, accounting for noise in the data substantially reduces inequality measures. Since this reduction is most pronounced in Russia, underlying inequality in these two countries is more similar than the uncorrected inequality measures would suggest. Second, individuals in both countries face much economic insecurity – the median absolute annual change in income or expenditure is around 50% in Russia and around 20% in Poland. However, around half of these fluctuations reflect measurement error or transitory shocks. Hence, underlying income or expenditure levels are much more stable. Third, the apparent high levels of economic mobility are largely driven by transitory events and noisy data. After accounting for transitory shocks, around 80% of the poor in Russia and Poland remain in poverty for at least one year. Hence, there is a real risk that an entrenched underclass emerges in these transition economies.

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Table 6. Poverty and Underclass in Poland

	Traditional poverty (20 % poorest based on expenditure in 1994)			Broad underclass (20 % poorest based on average expenditure in 1993-96)				Severe underclass (10 % poorest based on average expenditure in 1993-96)			
	Poverty Rate	SE	t-stat. (1)	Poverty Rate	SE	t-stat. (4)	t-stat. (4)-(1)	Poverty Rate	SE	t-stat. (8)	t-stat. (8)-(4)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Whole sample	0.200	0.001	n/a	0.200	0.001	n/a	n/a	0.100	0.001	n/a	n/a
Age Groups											
0-15	0.287	0.006	13.7	0.293	0.006	15.0	1.2	0.160	0.004	15.2	4.7
16-30	0.206	0.007	0.8	0.204	0.007	0.7	-0.2	0.094	0.005	-1.0	-2.0
31-50	0.191	0.004	-2.3	0.191	0.005	-2.0	0.0	0.099	0.003	-0.4	1.5
51-64	0.101	0.008	-12.7	0.090	0.007	-15.7	-1.8	0.034	0.004	-16.0	-3.4
65+	0.133	0.011	-6.1	0.129	0.011	-6.7	-0.5	0.047	0.007	-7.3	-3.4
Access to land											
No	0.176	0.007	-3.5	0.175	0.007	-3.6	-0.2	0.088	0.006	-2.0	0.2
Yes	0.215	0.004	3.5	0.215	0.004	3.7	-0.1	0.107	0.003	2.0	-0.2
Own Automobile											
No	0.265	0.006	11.0	0.273	0.006	11.6	1.8	0.145	0.004	10.6	2.9
Yes	0.121	0.007	-11.5	0.110	0.007	-12.1	-2.1	0.044	0.005	-11.4	-2.9
Household typology											
Single parent with child(ren)	0.302	0.041	2.4	0.290	0.042	2.2	-0.3	0.138	0.029	1.3	-0.3
Other family with child(ren)	0.258	0.007	8.6	0.270	0.007	10.0	2.0	0.147	0.005	8.8	2.8
Single elderly male	0.102	0.063	-1.6	0.088	0.073	-1.5	-0.2	0.081	0.067	-0.3	1.0
Single elderly female	0.133	0.032	-2.1	0.098	0.026	-4.0	-1.2	0.022	0.013	-5.9	-2.1
Multiple elderly	0.101	0.029	-3.4	0.114	0.031	-2.7	0.6	0.040	0.018	-3.3	-1.3
Other family without children	0.139	0.007	-9.0	0.126	0.007	-10.5	-2.1	0.052	0.005	-9.2	-2.6
Number of Children under 15											
Zero	0.097	0.007	-14.3	0.085	0.007	-17.1	-2.1	0.032	0.004	-17.1	-3.2
One	0.167	0.011	-3.0	0.172	0.014	-2.1	0.5	0.068	0.008	-3.9	-2.9
Two	0.231	0.013	2.4	0.238	0.013	2.9	0.6	0.118	0.009	2.0	-0.1
Three or more	0.419	0.019	11.5	0.424	0.019	11.8	0.3	0.258	0.015	10.6	4.5
Number of income earners											
Zero	0.207	0.006	1.0	0.199	0.006	0.0	-1.3	0.102	0.005	0.4	0.5
One	0.248	0.011	4.5	0.263	0.012	5.5	1.5	0.138	0.009	4.3	0.9
Two	0.118	0.012	-6.8	0.113	0.012	-7.0	-0.5	0.042	0.008	-7.2	-2.3
Three or more	0.150	0.042	-1.2	0.152	0.044	-1.1	0.1	0.073	0.029	-0.9	-0.1
Gender of household head											
Male	0.196	0.004	-0.9	0.195	0.004	-1.1	-0.4	0.099	0.003	0.0	0.9
Female	0.211	0.012	0.9	0.212	0.011	1.1	0.1	0.100	0.009	0.0	-0.9
Labor market status of household head											
Employed	0.199	0.004	-0.4	0.198	0.004	-0.3	-0.2	0.098	0.003	-0.7	-0.6
Unemployed	0.609	0.045	9.1	0.546	0.047	7.4	-1.5	0.344	0.046	5.3	2.0
Retired	0.154	0.012	-4.0	0.162	0.011	-3.3	1.0	0.075	0.009	-2.7	-1.0
Other	0.578	0.100	3.8	0.470	0.104	2.6	-1.0	0.368	0.098	2.7	1.8
Age & education of household head											
16-30 Primary	0.405	0.088	2.3	0.326	0.072	1.8	-1.0	0.142	0.060	0.7	-0.4
16-30 Basic Vocational	0.296	0.029	3.4	0.291	0.029	3.2	-0.2	0.138	0.024	1.6	-0.4
16-30 Secondary	0.122	0.037	-2.1	0.127	0.032	-2.3	0.1	0.025	0.014	-5.4	-2.5
16-30 Higher	0.103	0.065	-1.5	0.058	0.057	-2.5	-1.0	0.000	0.000	n/a	n/a
31-50 Primary	0.370	0.024	7.2	0.389	0.022	8.7	1.0	0.232	0.019	6.8	2.9
31-50 Basic Vocational	0.258	0.012	4.8	0.260	0.011	5.5	0.2	0.135	0.009	3.8	0.9
31-50 Secondary	0.136	0.013	-4.8	0.134	0.012	-5.4	-0.2	0.068	0.009	-3.4	0.2
31-50 Higher	0.048	0.015	-10.2	0.032	0.010	-16.8	-1.1	0.007	0.006	-15.2	-1.4
51-64 Primary	0.155	0.017	-2.7	0.159	0.018	-2.3	0.3	0.056	0.012	-3.7	-2.2
51-64 Basic Vocational	0.109	0.030	-3.0	0.097	0.028	-3.7	-0.7	0.048	0.022	-2.3	0.0
51-64 Secondary	0.050	0.016	-9.6	0.054	0.017	-8.5	0.2	0.010	0.006	-14.6	-2.0
51-64 Higher	0.018	0.015	-11.9	0.020	0.014	-12.7	0.3	0.014	0.013	-6.3	0.5
65+ Primary	0.195	0.025	-0.2	0.191	0.026	-0.3	-0.2	0.074	0.018	-1.5	-1.6
65+ More than primary	0.058	0.020	-7.0	0.033	0.013	-12.4	-1.6	0.021	0.013	-6.1	0.5
Subjective living condition											
Very bad	0.500	0.030	10.1	0.504	0.030	10.2	0.2	0.347	0.028	8.7	4.3
Bad	0.300	0.010	9.9	0.299	0.011	8.8	-0.1	0.150	0.009	5.4	0.1
Average	0.127	0.006	-11.4	0.124	0.006	-12.1	-0.5	0.050	0.004	-11.4	-3.3
Good or very good	0.046	0.012	-13.1	0.055	0.012	-12.2	1.0	0.014	0.006	-13.3	-2.2
Quintile in average expenditure ('93-'96)											
Bottom	0.740	0.015	35.8	1.000	n/a	n/a	n/a	0.500	n/a	n/a	n/a
Second	0.181	0.016	-1.2	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a
Third	0.062	0.010	-13.4	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a
Fourth	0.019	0.005	-35.5	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a
Top	0.006	0.003	-75.5	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a

Notes: Demographic characteristics are measured in the base period, which is 1994 for Poland. Expenditure is adjusted for family size using the baseline equivalence scale. The t-statistics in columns (3), (6) and (10) show whether the poverty rate for the demographic group is significantly different from the national average. The t-statistic in column (7) tests the difference between columns (4) and (1) while the t-statistic in column (11) tests the difference between columns (8) and (4).

Table 7. Poverty and Underclass in Russia

	Traditional poverty (20 % poorest based on expenditure in 1995)			Broad underclass (20 % poorest based on average expenditure in 1994-98)				Severe underclass (10 % poorest based on average expenditure in 1994-98)			
	Poverty Rate	SE	t-stat.	Poverty Rate	SE	t-stat.	t-stat.	Poverty Rate	SE	t-stat.	t-stat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Whole sample	0.200	0.001	n/a	0.200	0.001	n/a	n/a	0.100	0.000	n/a	n/a
Age Groups											
0-15	0.243	0.011	3.8	0.245	0.010	4.4	0.3	0.130	0.008	3.9	1.3
16-30	0.178	0.011	-2.1	0.167	0.011	-3.0	-1.0	0.081	0.009	-2.1	-0.3
31-50	0.183	0.008	-2.2	0.178	0.008	-2.6	-0.5	0.087	0.006	-2.1	-0.6
51-64	0.169	0.015	-2.1	0.159	0.015	-2.8	-0.8	0.073	0.011	-2.4	-0.8
65+	0.237	0.017	2.1	0.262	0.017	3.6	1.4	0.134	0.014	2.5	0.3
Access to land											
No	0.217	0.016	1.0	0.245	0.016	2.9	1.9	0.127	0.014	2.0	0.5
Yes	0.195	0.005	-1.0	0.185	0.005	-2.8	-2.2	0.091	0.005	-2.0	-0.5
Own Automobile											
No	0.238	0.005	8.2	0.240	0.005	8.4	0.3	0.123	0.003	8.0	1.2
Yes	0.081	0.014	-8.3	0.072	0.013	-10.0	-0.6	0.027	0.008	-8.9	-1.2
Household typology											
Single parent with child(ren)	0.222	0.034	0.6	0.221	0.032	0.7	0.0	0.110	0.024	0.4	0.0
Other family with child(ren)	0.216	0.007	2.0	0.211	0.007	1.7	-0.6	0.108	0.005	1.6	0.7
Single elderly male	0.156	0.065	-0.7	0.144	0.061	-0.9	-0.3	0.041	0.032	-1.8	-0.9
Single elderly female	0.266	0.032	2.1	0.333	0.032	4.2	2.1	0.193	0.026	3.5	1.6
Multiple elderly	0.157	0.022	-2.0	0.155	0.023	-2.0	-0.1	0.075	0.017	-1.4	-0.2
Other family without children	0.152	0.018	-2.8	0.142	0.014	-4.0	-0.6	0.057	0.010	-4.2	-1.8
Number of Children under 15											
Zero	0.166	0.011	-3.2	0.172	0.010	-2.8	0.6	0.083	0.008	-2.1	-0.5
One	0.195	0.016	-0.4	0.156	0.015	-2.9	-2.6	0.071	0.010	-2.9	-0.9
Two	0.211	0.017	0.6	0.229	0.020	1.5	1.1	0.111	0.014	0.9	-0.3
Three or more	0.346	0.046	3.2	0.373	0.045	3.9	0.7	0.226	0.035	3.6	1.6
Number of income earners											
Zero	0.377	0.058	3.1	0.365	0.064	2.6	-0.2	0.184	0.046	1.8	0.1
One	0.219	0.019	1.0	0.253	0.018	3.0	2.4	0.160	0.016	3.7	2.8
Two	0.197	0.012	-0.3	0.189	0.012	-0.9	-0.8	0.080	0.007	-2.7	-2.6
Three or more	0.176	0.015	-1.6	0.162	0.014	-2.7	-1.1	0.078	0.010	-2.1	-0.4
Gender of household head											
Male	0.188	0.004	-3.0	0.188	0.004	-3.0	0.1	0.092	0.003	-2.6	-1.0
Female	0.267	0.021	3.2	0.258	0.019	3.1	-0.4	0.141	0.016	2.6	1.0
Labor market status of household head											
Employed	0.188	0.006	-2.1	0.179	0.006	-3.5	-1.3	0.086	0.005	-2.8	-1.1
Unemployed	0.267	0.033	2.0	0.310	0.039	2.8	1.1	0.174	0.030	2.5	1.0
Retired	0.207	0.020	0.3	0.235	0.019	1.8	1.7	0.127	0.015	1.8	1.0
Other	0.247	0.042	1.1	0.207	0.038	0.2	-1.1	0.097	0.028	-0.1	-0.3
Age & education of household head											
16-30 High school or less	0.189	0.033	-0.3	0.234	0.039	0.9	1.2	0.102	0.026	0.1	-0.7
16-30 Technical/vocational	0.224	0.044	0.5	0.180	0.043	-0.5	-1.0	0.086	0.025	-0.6	-0.2
16-30 Higher	0.100	0.066	-1.5	0.015	0.017	-11.0	-1.3	0.000	0.000	n/a	n/a
31-50 High school or less	0.233	0.018	1.8	0.252	0.016	3.3	1.1	0.138	0.012	3.2	1.3
31-50 Technical/vocational	0.202	0.021	0.1	0.201	0.021	0.0	-0.1	0.102	0.016	0.2	0.2
31-50 Higher	0.137	0.024	-2.7	0.085	0.021	-5.6	-2.3	0.020	0.009	-8.8	-2.1
51-64 High school or less	0.199	0.029	-0.1	0.181	0.025	-0.8	-0.8	0.075	0.017	-1.4	-1.0
51-64 Technical/vocational	0.200	0.050	0.0	0.181	0.045	-0.4	-0.5	0.116	0.037	0.4	1.2
51-64 Higher	0.089	0.031	-3.6	0.067	0.029	-4.5	-0.9	0.041	0.018	-3.2	0.6
65+ High school or less	0.278	0.028	2.8	0.334	0.027	4.9	2.2	0.172	0.024	3.0	0.3
65+ More than high school	0.071	0.033	-3.9	0.050	0.024	-6.3	-0.8	0.035	0.022	-2.9	0.7
Subjective living condition											
Very bad	0.319	0.023	5.2	0.317	0.024	4.8	-0.1	0.154	0.017	3.2	-0.3
Bad	0.215	0.010	1.6	0.212	0.010	1.2	-0.4	0.111	0.008	1.5	1.0
Average	0.131	0.009	-7.5	0.127	0.009	-8.5	-0.5	0.055	0.006	-7.4	-1.8
Good or very good	0.074	0.017	-7.6	0.069	0.017	-7.8	-0.3	0.036	0.012	-5.2	0.2
Unreported	0.245	0.012	3.8	0.253	0.011	4.9	0.8	0.133	0.007	4.6	1.1
Quintile in average expenditure ('94-'98)											
Bottom	0.646	0.023	19.5	1.000	n/a	n/a	n/a	0.500	n/a	n/a	n/a
Second	0.191	0.021	-0.4	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a
Third	0.085	0.017	-6.9	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a
Fourth	0.050	0.010	-14.8	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a
Top	0.028	0.008	-22.8	0.000	n/a	n/a	n/a	0.000	n/a	n/a	n/a

Notes: Demographic characteristics are measured in the base period, which is 1995 for Russia. Expenditure is adjusted for family size using the baseline equivalence scale. The t-statistics in columns (3), (6) and (10) show whether the poverty rate for the demographic group is significantly different from the national average. The t-statistic in column (7) tests the difference between columns (4) and (1) while the t-statistic in column (11) tests the difference between columns (8) and (4).

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